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Indian Standard

INLAND VESSELS — BELLOWS FOR DREDGERS — SPECIFICATION

UDC 629·122·621·611·2

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

October 1994

Price Group 4

Inland and Harbour Craft Sectional Committee, TE 18

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Inland and Harbour Craft Sectional Committee had been approved by the Transport Engineering Division Council.

This standard lays down the requirements for rubber bellows having metal coupling flanges to be used for coupling pipes of the delivery piping system of dredgers.

This standard is based on the information supplied by Bureau Veritas, Calcutta and Mazagon Docks, Bombay. Assistance has also been derived from Japanese Standard JIS F 3995-1991 'Discharge rubber sleeves for dredgers' issued by the Japanese Industrial Standards Committee (JISC).

The committee responsible for the preparation of this standard is given in Annex A.

For the purpose of deciding whether a particular requirement of this standard is complied with the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

INLAND VESSELS — BELLOWS FOR DREDGERS — SPECIFICATION

1 SCOPE

This Indian Standard lays down the requirements for bellows for coupling of delivery pipes of the dredgers.

2 REFERENCES

The following Indian Standards are necessary adjuncts to this standard:

IS No.	*Title*
443 : 1975	Method of sampling and test for rubber hoses (*second revision*)
1424 : 1983	Cotton canvas (*third revision*)
2062 : 1992	Steel for general structural purposes (*fourth revision*)

3 DIMENSIONS

3.1 The dimensions of the bellows shall be as given in Table 1.

3.2 The bellows may be supplied in lengths as agreed to between the purchaser and the supplier.

3.3 The permissible tolerance on length shall be ±2 percent.

3.4 Sizes other than those shown in Table 1 may be manufactured as agreed to between the purchaser and the supplier.

3.5 The dimensions of the flanges shall be as given in Table 2.

4 MATERIAL AND MANUFACTURE

4.1 The main body of bellows shall be manufactured from rubber.

4.2 The bellows shall be flexible and shall be free from flaws, cavities and cracks.

4.3 The rubber body shall comprise of three layers, namely, the tube, the filler and cover (*see* Fig. 1), each of which shall be firmly vulcanised on the coupling nipples (built-in type).

4.4 The welding of the flange and the neck (nipple) shall be such as not to cause any leakage or separation during use.

4.5 The flange part of the bellows shall be manufactured from steel conforming to Grade A or Grade B of IS 2062 : 1992 (or equivalent) duly ultrasonically tested. The nipple shall be manufactured of steel meeting the above requirements, duly provided with at least four rings of ample dimensions to achieve a leakproof end product. The assembly shall be suitably coated (galvanized or cadmium plated) to achieve better resistance to sea water action. One of the two flanges shall be loose in the nipple to facilitate matching of the bolt holes.

4.6 Tube

The tube shall comprise two abrasion resistant layers made of flexible, high tensile natural rubber satisfying the following requirements:

Requirement	*Minimum*	*Preferred*
Tensile strength	1·5 kN/cm²	1·76 kN/cm²
Elongation at break	450 percent	600 percent
Sohre 'A' hardness	55 to 60	

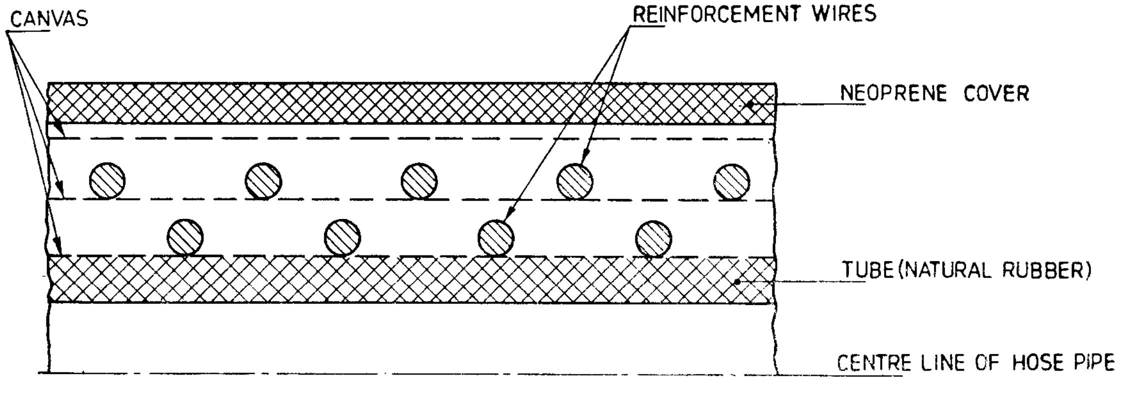


FIG. 1 DETAIL OF RUBBER BODY

4.6.1 *Filler and Reinforcement*

The tube shall be covered with a few layers of rubber impregnated canvas, followed by spiral wound high tensile galvanized steel wire, covered by a first layer rubber filler. This is to be followed in the same sequences by another layer of each for the higher size bellows.

4.6.2 *Cover*

The filler and reinforcement are to be covered with one or two layers of canvas and a layer of neoprene (cover) to comprise the outer layer of the hose. Thickness and layers of the cover shall be as given in Table 1.

5 WORKING AND TEST PRESSURES

5.1 Working Pressure

The working pressure of bellows shall be as given in Table 3.

5.2 Test Pressure

The bellows shall be tested hydraulically with water as medium for a period not less than 5 min at working and test pressures as indicated in Table 3 during which no leakage, local deformation etc, shall be noticeable. The change in length shall be measured as per the procedure laid down in **8.4** of IS 443 : 1975, and that of outside diameter as per **8.5** of IS 443 : 1975.The change in length of the bellows shall be measured on the whole length and that of the diameter in the middle of the bellow.

5.2.1 At the end of the test the bellow shall meet the requirements given below:

a) Permissible change in length under working pressure : ± 10 percent

b) Permissible change in length under test pressure ± 15 percent

c) Permissible change in diameter under working pressure ± 5 percent

d) Permissible change in diameter under test pressure ± 7·5 percent

5.3 Bend Test

The permissible curve angle for the bellows, as shown in Fig. 2, shall not be less than 10°. The angle is determined by measuring the maximum angle at which the bellows does not break, when the flange on one side is kept fixed while the flange on the other side is bent. The bellows shall be kept empty during the test.

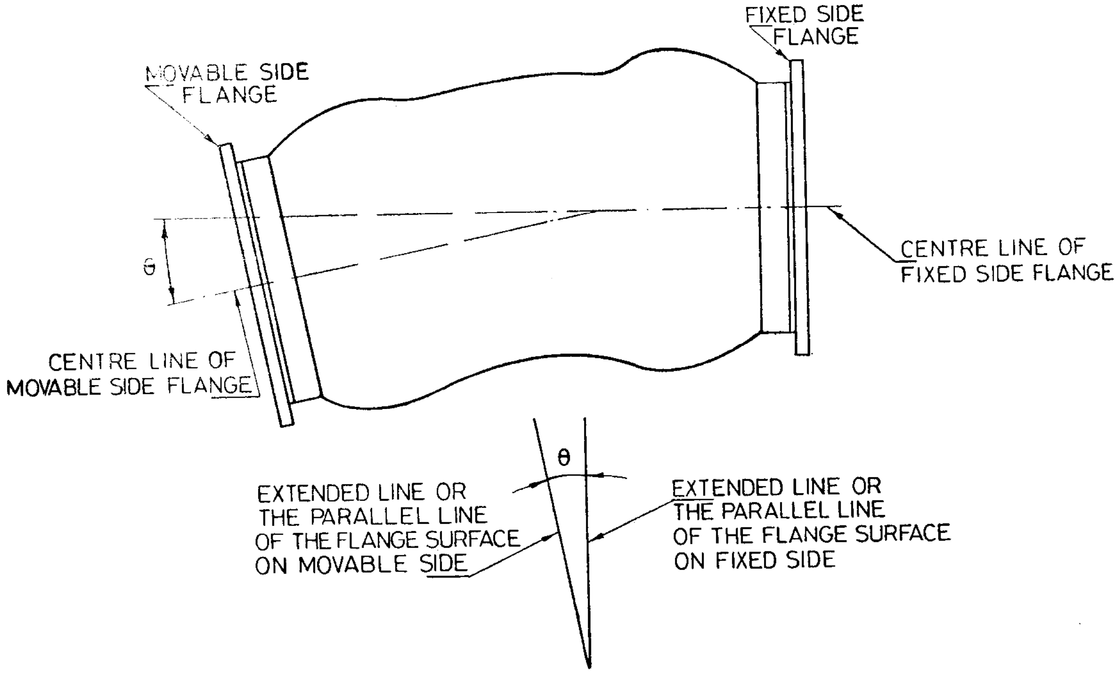

FIXED SIDE FLANGE
MOVABLE SIDE FLANGE
θ
CENTRE LINE OF FIXED SIDE FLANGE
CENTRE LINE OF MOVABLE SIDE FLANGE
θ
EXTENDED LINE OR THE PARALLEL LINE OF THE FLANGE SURFACE ON MOVABLE SIDE
EXTENDED LINE OR THE PARALLEL LINE OF THE FLANGE SURFACE ON FIXED SIDE

FIG. 2 BENDING ANGLE OF SLEEVE

Table 1 Dimensions for Bellows

(*Clauses* 3.1 *and* 3.4)

All dimensions in millimetres.

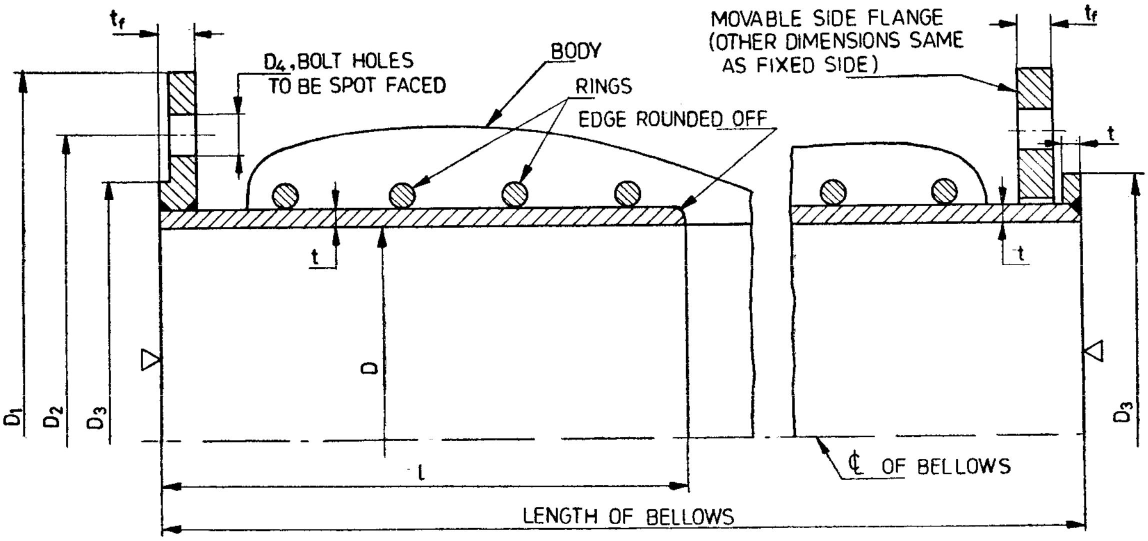
Nominal Size	**Tube**		**Filter and Reinforcement**								**Neoprene Cover**	
	Inside dia	Thickness + 3 − 0	Inner Layer Canvas (IS 1424 : 1983)				Outer Layer Canvas (IS 1424 : 1983)					
			g/m²	No. of Wraps*	Wire SWG	Rubber	g/m²	No. of Wraps*	Wire SWG	Rubber	Total Thickness	No. of Layers
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1	203 ± 3	10	340	8	6	5	—	—	—	—	3	1
2	254 ± 3	10	340	10	6	5	—	—	—	—	3	1
3	305 ± 5	10	340	6	6	5	283	6	6	5	3	1
4	356 ± 5	10	340	7	6	3	—	7	6	5	4	1
5	406 ± 5	12	396	8	6	3	—	8	6	5	4	1
6	508 ± 5	12	396	10	3	6	—	10	6	5	4	1
7	610 ± 5	12	396	12	3	6	—	12	6	5	4	1
8	686 ± 5	12	396	14	3	6	—	13	6	5	5	2
9	762 ± 5	14	453	15	3	6	340	15	6	5	5	2
10	838 ± 5	14	453	17	3	6	—	16	6	5	5	2
11	914 ± 5	14	453	18	3	6	—	18	6	5	5	2
12	990 ± 5	14	453	20	3	6	—	19	3	6	6	2
13	1 067 ± 5	16	509	21	3	6	396	21	3	6	6	2
14	1 143 ± 5	16	509	23	3	6	—	22	3	6	6	2
15	1 219 ± 5	16	509	24	3	6	—	24	3	6	6	2

*The canvas layers mav be reduced to half the specified number if nylon wrap tape is used instead of canvas.

Table 2 Dimensions for Flanges

(*Clause* 3.5)

All dimensions in millimetres.


t_f
D_4,BOLT HOLES TO BE SPOT FACED
BODY
RINGS
EDGE ROUNDED OFF
MOVABLE SIDE FLANGE (OTHER DIMENSIONS SAME AS FIXED SIDE)
t_f
t
t
t
D
D_1
D_2
D_3
D_3
l
℄ OF BELLOWS
LENGTH OF BELLOWS

Nominal Size	Inside Dia D	Flange Dia D_1 $+3$ -2	Pitch Dia-meter D_2 ± 1	Relief Dia D_3 ± 2	Flange Thick-ness t_f ± 2	No. of Bolts	Hole Dia D_4	Length of Nipple l	Nipple Thick-ness t
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1	203 ± 3	345	290	245	12	8	20	375	6
2	254 ± 3	395	340	300	12	8	20	425	6
3	305 ± 5	455	400	355	12	8	20	475	6
4	356 ± 5	505	450	395	16	12	25	525	8
5	406 ± 5	585	520	465	16	12	25	575	8
6	508 ± 5	710	650	595	16	12	25	625	8
7	610 ± 5	820	750	685	20	18	27	675	10
8	686 ± 5	905	840	775	20	18	27	725	10
9	762 ± 5	1 010	930	865	20	18	27	775	10
10	838 ± 5	1 070	1 010	940	25	24	30	825	12
11	914 ± 5	1 145	1 045	975	25	24	30	875	12
12	990 ± 5	1 220	1 080	1 010	25	24	30	925	12
13	1 067 ± 5	1 310	1 160	1 080	30	32	33	975	14
14	1 143 ± 5	1 400	1 240	1 160	30	32	33	1 025	14
15	1 219 ± 5	1 490	1 320	1 240	36	32	33	1 075	14

NOTE — Number of bolt holes and hole diameter are given for guidance only. The number of holes shall be as agreed between the manufacturer and the purchaser.

Table 3 Working and Test Pressure

(*Clauses* 5.1 *and* 5.2)

Nominal Size	Dia mm	Working Pressure MPa	Test Pressure
1	203	0·5	1·5 times the working pressure
2	254	0·5	,,
3	305	0·5	,,
4	356	0·6	,,
5	406	0·6	,,
6	508	0·8	,,
7	610	0·8	,,
8	686	0·9	,,
9	762	1·0	,,
10	838	1·0	,,
11	914	1·2	,,
12	990	1·2	,,
13	1 067	1·5	,,
14	1 143	1·5	,,
15	1 219	1·5	,,

6 MARKING

6.1 Each bellow shall be legibly and indelibly marked with the following:

a) Manufacturer's name or trade-mark, if any;
b) Nominal size;
c) Batch number; and
d) Month and year of manufacture.

6.2 BIS Certification Marking

The product may also be marked with the Standard Mark.

6.2.1 The use of the Standard Mark is governed by the provisions of the Bureau of Indian Standards Act, 1986 and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of Standard Mark may be granted to the manufacturers or producers may be obtained from the Bureau of Indian Standards.

7 DESIGNATION

The bellows shall be designated as follows:

a) Description;
b) Number of this standard; and
c) Nominal size.

Example :

Bellows for dredgers conforming to this standard and nominal size 10 shall be designated

Bellows for dredgers —
IS 14171-10

ANNEX A

(*Foreword*)

COMMITTEE COMPOSITION

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Director (Transport Engg), BIS

(*Continued on page* 7)

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